

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

D. Remarks

Claim Rejections of Form:

Claim 1 has been amended to address this rejection. The term “electrical connection” has
5 been changed to “connection”.

Rejection of Claims 1-2 Under 35 U.S.C. §103(a), based on *Liaw* (USP 5,807,779) in view of
Applicant’s Background Art (*Background Art*).

The semiconductor device structure on a silicon substrate of amended claim 1 includes a
10 contact, a gate electrode, an insulating film, and a silicon nitride film for preventing carbon
diffusion. The contact penetrates an interlayer insulating film and is in physical contact with a
diffusion layer in the silicon substrate. The gate electrode is formed on the silicon substrate and
contains a nitride film at upper and side portions. The insulating film is formed from a gas
containing carbon. The silicon nitride film for preventing carbon diffusion has a portion
15 sandwiched between the interlayer insulating film and the silicon substrate and adjacent to the
gate electrode in a direction essentially parallel to a substrate surface, such a sandwiched portion
having a thickness in a direction perpendicular to the substrate surface that is less than a
thickness of the gate electrode in the perpendicular direction, the silicon nitride film traversing a
region except a portion for providing the connection between the contact and the diffusion layer,
20 and is formed on the nitride film at the upper and side portions of the gate electrode wherein the
silicon nitride film for preventing carbon diffusion includes a portion having a bottom surface in
contact with and extending parallel to the diffusion layer away from the gate electrode and a top
surface in contact with the interlayer insulating film.

As is well established, a prima facie case of obviousness requires a rejection to meet three
25 basic criteria. First, there must be some suggestion or motivation to modify a reference or
combine reference teachings. Second, there must be a reasonable expectation of success.
Finally, the prior art reference(s) must teach or suggest all claim limitations.¹

Liaw does not teach or suggest the silicon nitride film for preventing carbon diffusion
including a portion having a bottom surface in contact with the diffusion layer as required in
30 amended claim 1.

¹ MPEP §2143.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Liaw discloses a tungsten layer 15 (alleged to correspond to Applicant's contact of claim 1) connected to a doped source/drain region (argued to correspond to Applicant's diffusion layer). *Liaw* also discloses a silicon nitride layer 9 (alleged to correspond to applicant's silicon nitride film for preventing carbon diffusion). However, in *Liaw* the silicon nitride layer does not have a bottom portion "in contact with the diffusion layer" (i.e. the diffusion layer that is in physical contact with the tungsten layer 15), as recited in amended claim 1.

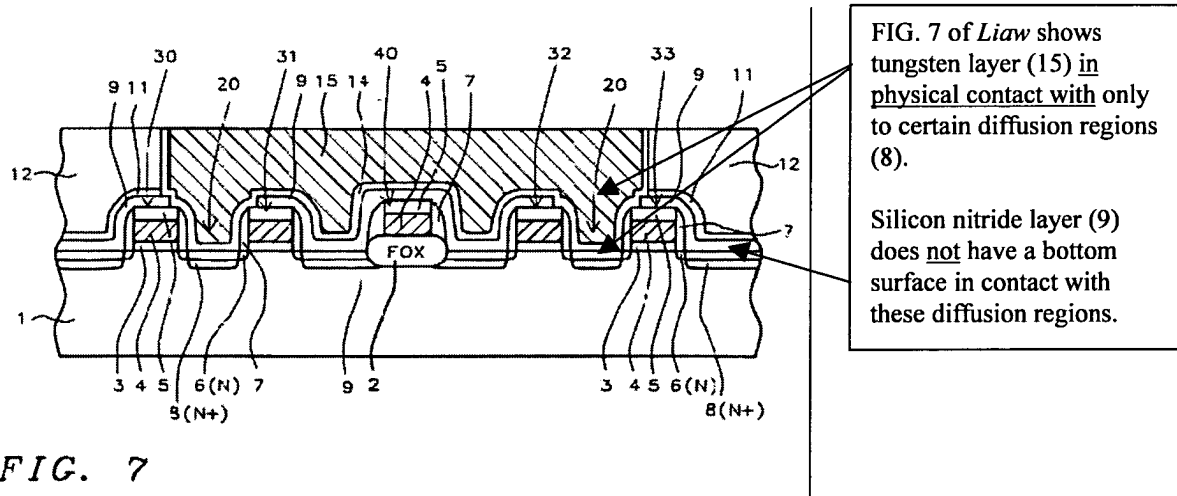


FIG. 7

The other reference relied upon does not show such a limitation, either.

Applicant's *Background Art* shows conventional silicon nitride side walls (24 or 40) formed on the side of a word line and bit line. However, such side walls do not have a portion parallel to a diffusion region, as recited in amended claim 1.²

Accordingly, because the combination of references does not show or suggest all the limitations of Applicant's amended claim 1, a prima face case of obviousness is not believed to exist, and this ground for rejection is traversed.

Claims 26-29 are newly added claims which correspond to previously cancelled claims 21-24. Thus, the arguments set forth below are directed to the rejections of claims 21-24 in the Office Action dated 06/02/04.

² See Applicant's Specification, FIG. 16 and 17. Side wall 24 (of FIG. 16) and side wall 40 (of FIG. 17) only have vertical portions.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Rejection of Claims 26 and 27 Under 35 U.S.C. §102(b) based on Nakamura et al. (U.S. Patent No. 5,986,299).

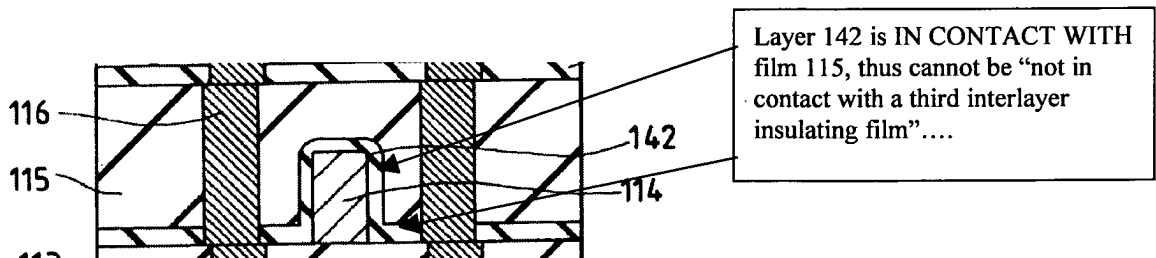
The invention of claim 26 is directed to a semiconductor device structure that includes an insulating film formed from a gas containing carbon. The semiconductor device structure includes a contact, a capacitor contact that penetrates second and third interlayer insulating films, and a conductor formed on the second interlayer insulating film and below at least a portion of the third interlayer insulating film.

The conductor contains a nitride film at upper and side portions. The side portion nitride film is in direct contact with the capacitor contact and the conductor and not in contact with the third interlayer insulating film. In addition, the semiconductor device includes a silicon nitride film for preventing carbon diffusion. The silicon nitride film is formed on the third interlayer insulating film while traversing a region except a connection portion between a lower electrode and the capacitor contact. The silicon nitride film is formed above the nitride film at the upper portion of the conductor.

As is well known, a claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single reference.

The cited reference *Nakamura et al.* does not show a side portion nitride film that is both in direct contact with the capacitor contact and not in contact with the third interlayer insulating film.

Nakamura et al. shows a film 142 (argued to correspond to Applicant's side portion nitride film) formed on a second layer wiring 114 (argued to correspond to Applicant's conductor). However, as shown below, all side portions of film 142 are in contact with the third insulating film 115 (argued to correspond to Applicant's third interlayer insulating film).



Accordingly, because the cited reference does not show all limitations of amended claim 26, this

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

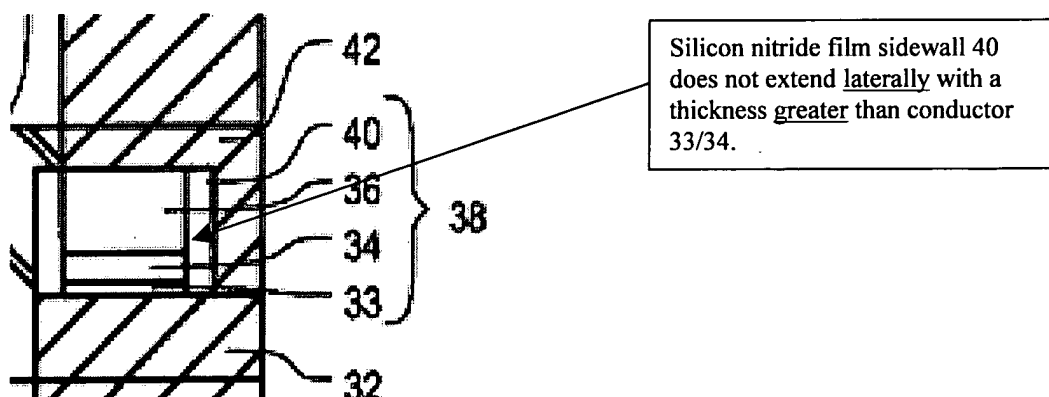
ground for rejection is traversed.

Rejection of Claims 28 and 29 Under 35 U.S.C. §102(a) based on *Background Art* (Applicant's *Background Art*).

The invention of claim 28 is directed to a semiconductor device on a silicon substrate having a device structure including an insulating film formed from gas containing carbon. The semiconductor device includes a contact electrically connected to a capacitor contact, and a conductor formed on a second interlayer insulating film and below at least a portion of the third interlayer insulating film. A nitride film is at upper and side portions of the conductor.

The semiconductor device further includes a silicon nitride film for preventing carbon diffusion which is formed between the second and third interlayer insulating film and that extends over the second interlayer insulating film in a lateral direction with a vertical thickness less than that of the conductor traversing a region except a connection portion between the lower electrode and the capacitor contact. The silicon nitride film is also formed on the nitride film at the upper and side portions of the conductor.

The *Background Art* does not show a silicon nitride film as recited in amended claim 23. Applicant's *Background Art* shows a bit line 38 on which is formed a silicon nitride film sidewall 40. However, as shown below, such a silicon nitride sidewall does not extend over a second interlayer insulating film 32 in a lateral direction. Nor does such a sidewall have a vertical thickness less than that of the conductor.



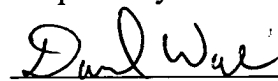
Accordingly, because the cited reference does not show all limitations of amended claim 23, this ground for rejection is traversed.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Claim 1 has been amended.

Claims 26-29 are newly added claims, which correspond to previously cancelled claims 21-24. Claims 21-24 were previously cancelled in an after final amendment of September 27, 2004 which was filed in response to an Advisory Action dated August 18, 2004 indicating claims 1, 2, and 25 were allowed. However, after the After Final Amendment was filed canceling claims 21-24 in order to allow a patent to issue, a new Office Action dated October 26, 2004 was issued withdrawing the allowance of claims 1, 2, and 25. Thus, claims 26-29 present no new matter.

Respectfully Submitted,

 January 19, 2006
Darryl G. Walker
Reg. No. 43,232

Darryl G. Walker
WALKER & SAKO, LLP
300 South First Street
Suite 235
San Jose, CA 95113
Tel. 1-408-289-5314